



**AIRBORNE GEOPHYSICAL SURVEY OF THE
TWILLICK BROOK REGION, NEWFOUNDLAND**

NTS MAP AREA 2D/04 AND
PARTS OF 1M/13, 1M/14, 2D/03 AND 2D/05,

TERNARY RADIODELEMENT IMAGE

MAP 2020-10
OPEN FILE NFLD/3383
Map 10 of 13

G.J. Kilfoil

ABOUT THE SURVEY

Introduction
This quantitative gamma-ray spectrometric, aeromagnetic and VLF-Electromagnetic airborne geophysical survey of Twillick Brook region, Newfoundland, was completed by Sander Geophysics Limited. The survey was flown from October 17th to November 10th, 2019 using a single Cessna 208 Caravan (C-GS63). The nominal flight and line spacing were, respectively, 50 m and 100 m. The survey was flown at an altitude of 100 m at an azimuth bearing of 070° and a flight speed of 100 km/h. The survey was oriented 13° with orthogonal control lines. The flight path was recovered following post-flight Precise Point Positioning (PPP) corrections. No data reduction techniques were applied to raw data recorded by a Global Positioning System.

Gamma-ray Spectrometric Data
The airborne gamma-ray measurements were made with a Sander Geophysics SGLSpec gamma-ray spectrometer housed in a 102.0 cm diameter cylindrical lead shield with a 10.2 cm thick lead brick and a 10.2 cm thick lead brick on the sides. The detector volume is 8.4 liters, shielded by the main array, used to detect variations in background radiation caused by atmospheric radon. The system is also used to detect gamma-ray peaks from the ground, including the natural potassium, uranium, thorium peaks. Upward crystals were provided a small cesium source to calibrate the three detectors.

Potassium is measured directly from the 1460 keV gamma-ray photons emitted by K^{40} , whereas uranium and thorium are measured indirectly from gamma-ray photons emitted by U^{238} and T^{232} respectively. The decay chains for these isotopes are measured to be in equilibrium with their parents; thus gamma-ray spectra measurements of uranium and thorium are referred to as equivalent uranium and equivalent thorium, i.e. eU and eTh . The energy windows used to measure these isotopes are 1460 keV, 238 keV and 232 keV, respectively.

Gamma-ray spectra were recorded at one-second intervals. Data processing followed standard procedures as described in IAEA, 1991 and IAEA, 2003. During processing, the spectra were energy calibrated, and counts were accumulated into the windows described above. Counts were then converted to activity concentrations for uranium and thorium using the decay constants and efficiencies recorded in the cosmic window. The window counts were corrected for background activity from cosmic radiation, radioactivity of the aircraft and atmospheric radon. The window counts were then converted to activity concentrations for the natural potassium, uranium, and thorium peaks. Corrections for deviations from the planned terrain clearance and for variation of temperature and pressure were made prior to conversion to ground concentrations of potassium, uranium and thorium, using factors determined from flights over the Breckenridge, Quebec calibration range.

Conversions were interpolated to a 30 m grid and applied. The resulting data are in activity concentrations, which is converted to a ground surface concentration that is corrected by varying amounts of overburden, overlying sediments, and surface water. As a result the measured concentrations are usually lower than the actual bedrock concentrations. The total air absorbed dose rate in microgray per hour was produced from measured counts between 400 and 900 keV.

Magnetic Data
The magnetic field was sampled 10 times per second using three split-beam cesium vapor magnetometers (sensitivity = 0.005 nT) mounted on the aircraft. The magnetometers were calibrated for uncorrected magnetic field measurements. The horizontal dimension of 19.0 m and a longitudinal dimension of 10.0 m. Differences in magnetic values at the intersections of control and survey lines were removed by subtracting the average value of the survey line from the average value of the control line. The Reference Field (GRF) defined at the average GPS altitude of 313 m for the date November 1st was then removed. Removal of the GRF from the data was done by subtracting the average value of the survey line from the average value of the control line. The survey area was not affected. Variation in signal quality is also apparent in the data as bands of less coherent data.

Additional Information
Data compilation and production were performed by Sander Geophysics Limited, Ottawa, Ontario. Contact information for the survey was provided by the Newfoundland and Labrador Department of Natural Resources.

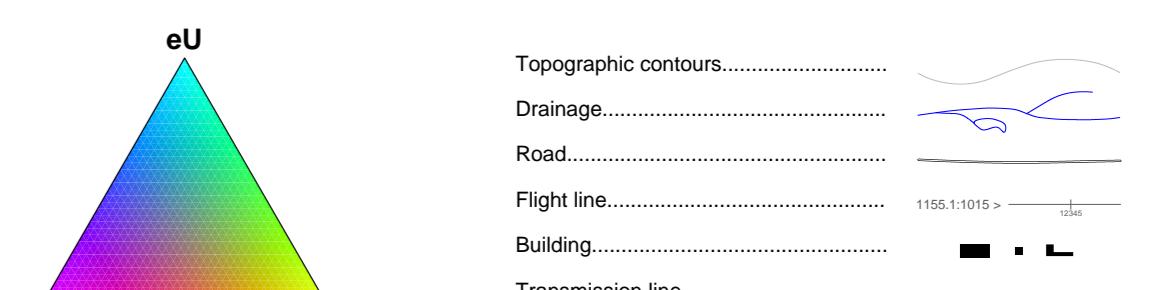
Copies of this map may be obtained from the Geological Survey, Department of Natural Resources, Government of Newfoundland and Labrador, PO Box 9700, St. John's, NL, Canada, A1B 4J6.

This map is subject to revision and modification. Comments to the author concerning errors or omissions are invited.

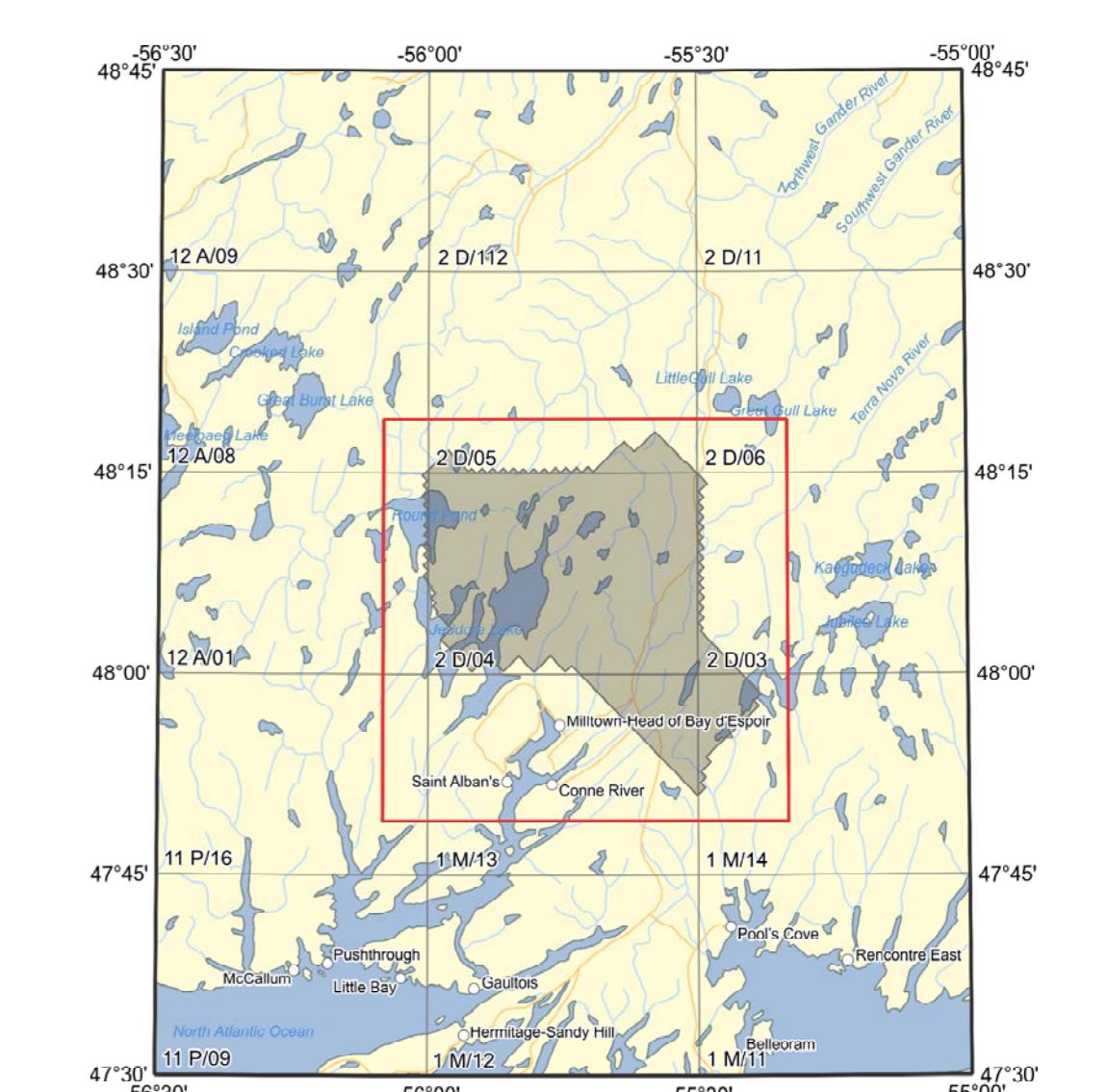
Department Website: <http://www.nr.gov.nl.ca/>
Email: gov.nr@nl.ca

References
Hoyle, P.J.
1965. Gradient measurements in aeromagnetic surveying. Geophysics, vol. 30, p. 891-902.

PLANIMETRIC SYMBOLS



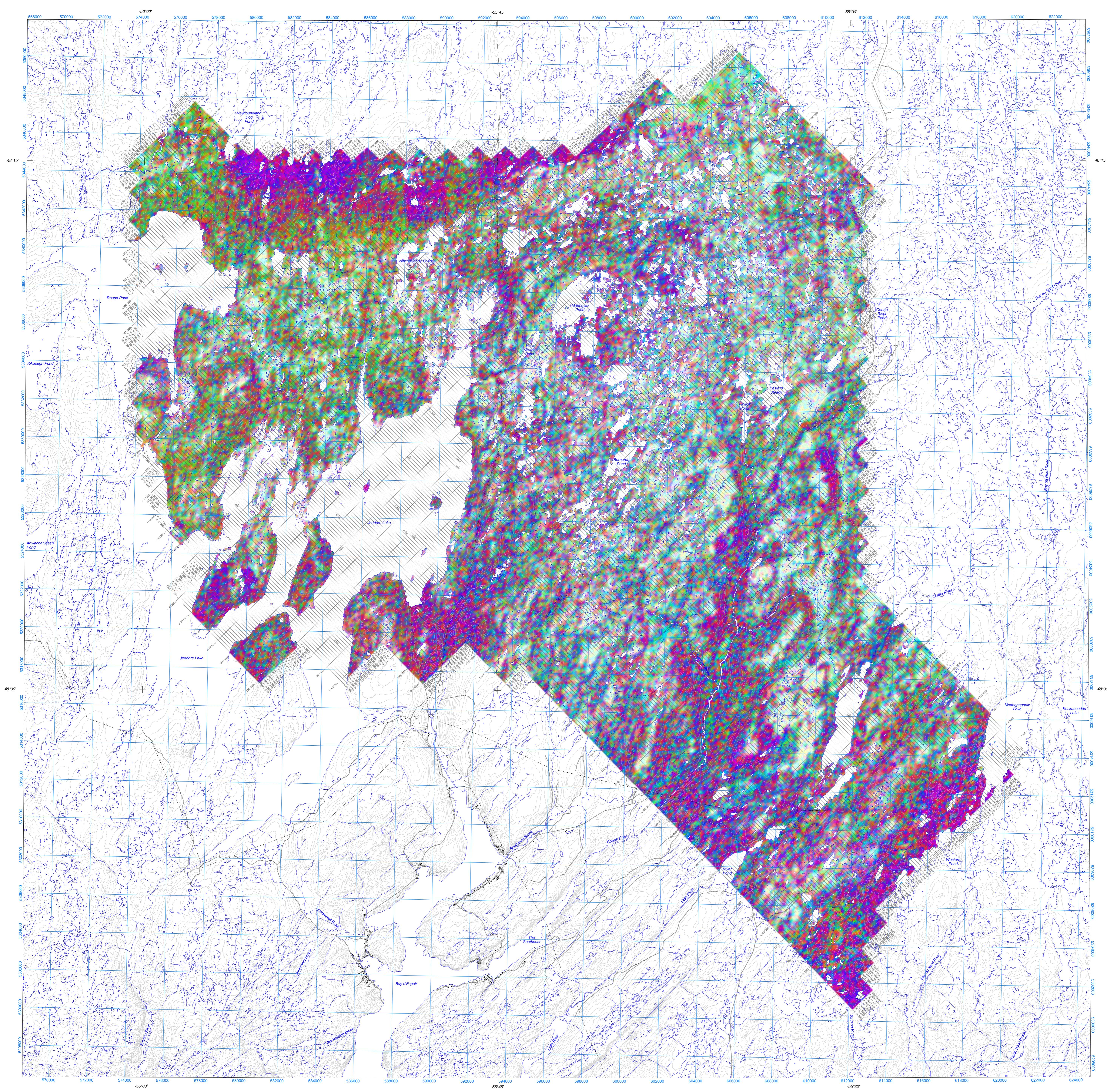
NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND GEOPHYSICAL MAP INDEX



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MAP 2020-10

TWILLICK BROOK

NTS MAP AREA 2D/04 AND PARTS OF 1M/13, 1M/14, 2D/03 AND 2D/05

Scale 1:75000
(meters)